WINCH SYSTEM COMPONENTS SPECIFICATION

1.0 General Requirements

This specification establishes performance requirements for components of a Bow/Stern Winch System to be installed on YTB-760 Class Tugboats. The following is an identification of the Winch System Components that are to be furnished:

- A quantity of one Combination Hawser Winch/Towing Bitt with 600' of 2" diameter braided Spectra line (or comparable braided line with 225,000-pound breaking strength)
- A quantity of one Double Drum Line Handling Winch with 375' of 2" diameter braided Spectra line (or comparable) on each drum, and an attached wildcat for 1" chain
- A quantity of one Main Hydraulic System (including pump, clutch, and tank) sized to meet winch pulling requirements, and designed for use with the existing GM 6-71 fire pump diesel power take-off (PTO)
- A quantity of one Backup Braking/Pulling System (reduced capability) for the winches when the GM 6-71 diesel is not operating
- A quantity of two Winch Control Stations (one for the pilothouse and one for the towing control station) plus local controls for the aft winch and forward wildcat.

At present, the YTB-835 carries a capstan and H-bitt aft, a capstan/windlass and H-bitt forward, two 800 psi hydraulic pumps (each driven by a 30 HP electric motor), and local control stations for each capstan. The existing hydraulic oil tank is 23"H x 54"L x 60"W (approximately 300 gallons) and physically supports both hydraulic pumps and their electric motors. It is anticipated that the aft capstan (with existing local controls) will be retained, along with one 800 psi hydraulic pump and electric motor (which will be placed on top of the new hydraulic tank).

The new Hawser Winch/Towing Bitt combination will replace the existing aft H-bitt, and the new double drum winch will replace the existing forward capstan and H-bitt. A new, smaller bitt will be added for mooring. Incorporation of a wildcat into the forward winch will allow the existing anchoring capability to be retained. The new main hydraulic pump will be driven by a power take-off from the GM 6-71 diesel that is now used only for the fire pump. For sizing purposes, it is anticipated that 165 HP will be continuously available from the power take-off to drive the main hydraulic pump. Since the main hydraulic pump will be operable only when the GM 6-71 diesel is running, it is envisioned that one of the existing electrically driven 30 HP/ 800 psi hydraulic pumps will be used to provide backup braking/reduced pulling capability for the new winches.

2.0 Combination Hawser Winch/Towing Bitt

The Combination Hawser Winch and Towing Bitt will be mounted on a common base, having the shortest possible length and will be in accordance with the following requirements:

- Drum capacity:	600' of 2" diameter braided Spectra line
- Line pull (minimum):	22,000 lbs. @ barrel working layer
	16,000 lbs. @ mid-drum layer

- Braking capacity (min.): 170,000 lbs. @ barrel working layer
  125,000 lbs. @ mid-drum layer
- Maximum length for H-bitt/winch combination (overall): 7'-6"
- Maximum width for H-bitt/winch combination (overall): 4'-0" to port of centerline, 8'-6" overall
- Features: Hydraulic drive, with braking capability independent of main hydraulics
  Levelwind
  Variable speed control
  Sub-base sufficiently strong to carry all H-bitt and winch loads, with provision for bolting to a deck foundation
  Sufficient space between winch and H-bitt to make line turns on H-bitt
  Primed and painted to resist corrosion (10-year coating)
  Designed to function in the marine environment, including elimination of water pockets

3.0 Double Drum Winch

The Double Drum Winch shall be in accordance with the following requirements:

- Configuration: Double drum, and a wildcat for 1" diameter stud link anchor chain
- Drum capacity: 375' of 2" diameter braided Spectra line (each drum)
- Line pull (minimum): 22,000 lbs. @ barrel working layer
  16,000 lbs. @ mid-drum layer
- Braking capacity (min.): 150,000 lbs. @ barrel working layer
  105,000 lbs. @ mid-drum layer
- Maximum fore-and-aft length: 5'-6"
- Maximum width (overall): 11'-0"
- Features: Hydraulic drive (for each drum, with clutch for wildcat)
  Braking capability independent of main hydraulics
  Variable speed control (for each drum, including the wildcat)
  Provision for bolting to a deck foundation
  Primed and painted to resist corrosion (10-year coating)
  Designed to function in the marine environment, including elimination of water pockets

4.0 Main Hydraulic System (Including Pump, Clutch and Tank)

The Main Hydraulic Pump shall include a Pump, Clutch and Tank and be of sufficient size to handle the maximum pulling power of one winch while simultaneously providing remote brake release/set capability to the other. It will operate off of the GM 6-71 fire pump diesel power take-off (PTO), which will provide up to 165 HP at 1800-1900 RPM. A clutch mechanism is required for engaging/disengaging the pump, and the overall length of the clutch plus pump should be no more than 60". The combination shall be mounted on a sub-base suitable for bolting to a hull foundation. It is anticipated that the new hydraulic system tank will fit immediately outboard of the clutch and pump, within the existing tank envelope. It will also support the retained 30 HP electric motor and 800 psi pump. The existing tank extends 21" inboard of the PTO centerline, 39" outboard of the PTO centerline, and 69" forward of the PTO itself. (A 15" space currently exists between the existing tank and PTO.)

5.0 Backup Braking/Pulling System

The Backup Hydraulic System to be furnished must be capable of providing remote brake release/set capability and reduced pulling capability for both winches. In addition, the backup system must be capable of being switched over to operate the existing aft capstan. It is anticipated that one of the existing 800 psi hydraulic pumps, driven by a 30 HP, 450V, 60Hz electric motor (1765 RPM), will be retained and available for use with the winches.

6.0 Winch System Control Stations

The Winch System to be furnished shall have two Winch Control Stations (one for the pilothouse and one for the towing control station), providing full capability for operating both the forward and aft winches (exclusive of the wildcat), are required for the YTB. In addition, local controls are required for the aft winch and forward wildcat. All control station boxes must be watertight, and be designed for corrosion resistance. The two main control station boxes should be identical, except that the pilothouse one will require a switch for main vs. backup hydraulic system selection. In general, the control system should be kept as simple as possible.

7.0 Technical Data Requirements

For each of the Winch System Components identified above the contractor shall provide a technical manual that describes the installation, operation, maintenance, troubleshooting and repair of the component. The contractor shall also provide drawings for each component that contain dimensional information along with the weight of each component and the center lines for installation purposes. The technical manuals and drawings may be submitted in commercial format.

8.0 Preservation, Packaging and Packing Requirements

The Winch System shall be preserved, packaged and packed in accordance with the contractor's standard commercial practices and procedures.

9.0 Shipping Address:

The Winch System Components shall be shipped to the following address:

Port Ops CNRNW
120 S. Dewey-Bldg 515
Bremerton, WA 98314-5005
Attn: Darryl Stuart
(360) 476-9663
E-Mail:
Stuart, Darryl D (CNRNW) [Stuart.Darryl@PACNW.navy.mil]

SHIP ALTERATION RECORD

SHIPALT IDENTIFICATION: YTB-211 K	REV: 00
BRIEF Winch System Installation	
NAVSEA/PEO LEAD TECH CODE CONCURRENCE:	
ENGINEERING AGENT CONCURRENCE:	
OTHER CONCURRENCES:	
LEAD LCM (Logistics):	
SAR APPROVER:	
PLANNING YARD TPOC: Peter W Witherell	

ESWBS Number:	58211	**3-M Noun Name:** Winch System Installation	
EIC:		**AIT CAPABLE: (Y/N)**	Y
SAFETY ALT: (Y/N)	N	**SUBSAFE IMPACT: (Y/N)**	Y
ILS AFFECTED: (Y/N)	Y	**SHIPBOARD STOWAGE AFFECTED:(Y/N)**	Y
CATEGORY CODE: (0-6)	0	**INDUSTRIAL STOWAGE AFFECTED: (Y/N)**	N
TOC:		**TMA/TMI:**	Y

DESCRIPTION:

Through reduced line handling requirements, greater pulling power, and the use of high strength/low stretch lines, winches provide greater operational efficiency and crew safety during towing and ship handling than is possible with capstans (see reference A). Whereas the YTB capstans are no longer logistically supportable, the use of winches also helps to extend the service life of YTBs which, because of their fendering and single screw configuration, are particularly well-suited to coming alongside and handling submarines. However, as references A, B, and C indicate, the benefits of a winch system aboard YTBs cannot be realized without some caveats relative to cost and vessel stability.

This SAR provides a YTB winch system installation which takes into account those cost and stability caveats, and which incorporates "lessons learned" from a prototype winch system installation aboard the POKAGON (YTB-836). For purposes of illustration, this SAR uses YTB-835 (SKENANDOA) as a baseline vessel for the new winch system installation (other YTB-760 Class installations will be similar). Figure 1 shows the existing YTB-835, and Figure 2 shows the tug after accomplishment of this ShipAlt. As Figure 2 shows, this ShipAlt includes the following major components:

- Combination hawser winch/H-bitt aft, with 600' of 225,000-pound breaking strength line
- Double drum hawser winch forward, with 300' of 225,000-pound breaking strength line on each drum, and an attached wildcat for 1" chain
- New main hydraulic system (including pump, clutch, and tank) sized to meet winch pulling requirements, and designed for use with the existing GM 6-71 fire pump diesel power take-off
- Backup braking/pulling system (reduced capability) for the winches when the GM 6-71 diesel is not operating
- Full winch system controls in the pilothouse (P/S), plus local controls for the aft winch and forward wildcat
- New bullnose chock, bow chocks, Panama chocks, roller fairleads, and deck staple
- New camera and closed circuit monitoring system, for visual monitoring of the aft hawser winch/H-bitt from the pilothouse.

Specifications for these components are provided on pages 5-6 of this SAR, and an overall description of removals and installations is provided on page 4.

APPLICABLE SHIPS:

YTB-760 Class

SHIP ALTERATION RECORD

References	
A	Witherell, P.W., "YTB-760 Class Winch Installation Study", PSNS Det Boston, Sept 2002
B	PSNS memorandum 9096 Ser 250.1/098, "YTB 836 Winch Conversion Stability Review", dtd 1 July 1997
C	PSNS memorandum 9096 Ser 250.1/217, "YTB 836 Winch Conversion Stability Update", dtd 14 July 1998

ESTIMATED WT & MOM			
WEIGHT	VCG	LCG	TCG
18.0 L.T.	21.6 ft	47 ft aft of FP	-

WT & MOM NOTES:

In reference B, it was determined that the installation of winches on YTB-836, when added to prior service life growth, would result in the following changes in displacement relative to the as-built conditions: 1) Condition A (Lightship) increase from 280 LT to 298 LT, 2) Condition B (Minimum Operating) increase from 309 LT to 327 LT, 3) Condition D, Contractual Full Load (50% fuel, no ballast) increase from 340 LT to 358 LT, and a 4) Condition D, Full Load Departure (100% fuel, peak and aft ballast tanks filled) increase to 417 LT. Reference B concluded that removing the capstans and adding winches would add a net 16.4 LT to the YTB-836 Condition B displacement, reduce metacentric height (GM) from 3.48' to 3.01', and make the YTB unable to meet Navy stability criteria for towing in Condition B.

After a review of YTB-836 installation drawings one year later, reference C concluded that the YTB-836 weight increase was 26.6 LT, not 16.4 as had been originally estimated, and that GM was reduced from 3.48' to 2.95', rather than the 3.01' that had been originally estimated. Almost all of the difference in weight and GM estimates was due to structural modifications that had not been anticipated. **To prevent towline tripping , reference C therefore recommended that the following restrictions be placed on YTB-836 towing operations:**

- **When the rudder angle exceeds 30 degrees, limit power to 75% of maximum horsepower. This limit may be approximated by limiting RPMs to 75% of the maximum allowable RPMs for the engine.**
- **When operating at more than 75% of maximum horsepower or more than 75% of maximum allowable RPMs, limit rudder angle to 30 degrees maximum.**

For this ShipAlt, it will not be possible to completely eliminate the weight and moment situation that led to the recommended restrictions on towing cited above. However, by reducing winch braking and line storage requirements relative to those used on YTB-836, and tailoring the system to be more compatible with YTB bollard pull capabilities, the weight growth/ GM reduction that occurred on YTB-836 can be largely avoided.

ALTERATION MATERIAL LIST (AML)

ITEM NO.	DESCRIPTION Note: ES = Equipment Specification on pages 5-6	UNIT OF ISSUE	QUANTITY	PROCURING ACTIVITY
1	Winch, combination H-bitt /towing hawser, with 600' of 2" dia Spectra line (or equal, w/ 225,000# min. breaking strength) (see ES)	each	1	IAF
2	Winch, double drum and anchor wildcat, with 300' of 225,000# BS line on each drum (see ES)	each	1	IAF
3	Hydraulic system kit, including backup (see ES)	each	1	IAF
4	Winch System controls (see ES)	shipset	1	IAF
5	Monitoring system, visual for aft winch (see ES)	each	1	IAF
6	Chock, bullnose (sim S/A YTB-174D, but w/ 8" dia double extra strong center pipe)	each	1	IAF
7	Chocks, Panama (10"x12" closed oval)	each	4	IAF
8	Fairleads, roller (14" diameter, vertical axis)	each	2	IAF
9	Staple, 12" pipe	each	1	IAF
10	Chock, 7"x14" closed (for bow)	each	2	IAF

SHIP ALTERATION RECORD

QUALITY ASSURANCE

Suppliers shall certify that the combination H-bitt /towing hawser winch and the double drum winch with wildcat meet the specifications given in this SAR.

SSRs: New technical manual required for winch system installation. Updates also required for Ship's Drawing Index (SDI) and Booklet of General Plans (BGP).

ILS CERT FORM: (Y/N) Y

SPCL DISPOSITION REQUIREMENTS FOR REMOVED MATERIAL

MATERIAL	DISPOSITION
(1) capstan/windlass	Turn over to nearest property manager.
Cleat, H-bitts, chocks	Turn over to nearest property manager

(CONTINUE ON ADDITIONAL SHEETS AS REQUIRED)

INSTALLATION SUPPORT AND TEST EQUIPMENT

N/A

SHIPBOARD STOWAGE DETAILS

N/A

SPECIAL INDUSTRIAL STOWAGE REQUIREMENTS

N/A

PROOFING REQUIREMENTS

The final installation shall be operationally proof tested to ensure that all requirements of this SAR have been met.

REQUIRED PRIOR OR CONCURRENT ALTS

S/A YTB-174D to replace existing bullnose chock, except use an 8" dia double extra strong center pipe instead of 12" diameter center pipe

REMOVALS/INSTALLATIONS, INCLUDING IMPACT ON OTHER SYSTEMS

REMOVALS (SEE FIGURE 1):

1) Remove the existing H-bitt at FR 38 and the existing deck cleat at FR 55.

2) Remove the existing bow chocks (at FR 1 on CL, and FR 2-1/2 (P/S)), forward capstan/windlass system, forward bitt, chain stopper, and bolted manhole at FR 2 (S) on the main deck. Also, remove the anchor chain roller fairlead and save for relocation.

3) Remove the aft portion of the bulwark at the anchor stowage notch from FR 8 to FR 10 (S).

4) Remove the existing hydraulic tank, pumps, and associated electric motors, saving one pump and one electric motor for reuse.

5) Remove the existing 18" escape scuttle at FR 11(P) and save for relocation.

INSTALLATIONS (SEE FIGURE 2):

1) Install the new combination H-bitt /towing hawser winch on a new main deck foundation, between FR 37 ½ and FR 41, on centerline. Also, install a new 12" pipe staple at FR 55 and two new 12"x10" oval Panama chocks at FR 43 (P/S).

2) Install the new double drum winch (with anchor wildcat) on a new main deck foundation, between FR 8 and FR 12. Relocate the anchor chain pipe and roller fairlead to suit the new wildcat location. Also, install two new 14" roller fairleads at FR 2-1/2, to lead lines from the double drum winch working areas back to new 12"x10" oval Panama chocks at FR 18 (P/S).

3) Install a new bullnose chock (S/A YTB-174D) at FR1 on centerline, and new 7"x14" closed chocks in place of the existing smaller closed chocks at FR 2-1/2 (P/S). Provide above-deck structural reinforcement for the new bullnose chock and 14" roller fairleads. Also provide a new section of bulwark on the (S) side that follows the line of the main deck from FR 10 to FR 9 and connects back to the existing bulwark at FR 8 (S).

4) Re-install the relocated 18" escape scuttle at FR 11(S), and install a new 6" T-bitt at FR 5.

5) If not existing, install horns through existing shoulder and quarter double-bitts, so that they become short "H-bitts". Each bitt horn should be fabricated from a length of 4" double extra strong pipe that passes horizontally through bitt barrels at mid-height, from about 10" aft of the aft barrel to 10" forward of the forward barrel.

6) Install a new main hydraulic tank and pump for the winch system, with a new clutch that permits the hydraulics to operate off of the GM 6-71 fire pump diesel power take-off (providing up to 165 HP at 1800-1900 RPM). Reinstall the retained 800psi hydraulic pump and electric motor, and configure the new hydraulic system so that the 800psi pump and electric motor will power the aft capstan or any of the winches (at reduced capability) when the diesel is off or not clutched to the new hydraulic pump.

7) Install two new winch control stations in the pilothouse (P/S), to allow full forward and aft winch control from either the port or starboard side. In addition, provide controls for the aft winch at the aft steering station (01 LVL), and a local control station for the wildcat on the main deck, forward of the deckhouse.

EQUIPMENT SPECIFICATION:

GENERAL

At present, the YTB-835 carries a capstan and H-bitt aft, a capstan/windlass and H-bitt forward, two 800psi hydraulic pumps (each driven by a 30 HP electric motor), and local control stations for each capstan. The existing hydraulic oil tank is 23"H x 54"L x 60"W (approximately 300 gallons) and physically supports both hydraulic pumps and their electric motors. It is anticipated that the aft capstan (with existing local controls), one 800psi hydraulic pump, and one electric motor will be retained, but the existing tank will be replaced with a new one having a 150-gallon capacity.

The new combination H-bitt /towing hawser winch will replace the existing aft H-bitt, and the new double drum winch will replace the existing forward capstan and H-bitt. A new, smaller bitt will be added for mooring. Incorporation of a wildcat into the forward double drum winch will allow the existing anchoring capability to be retained. The new main hydraulic pump will be driven by a power take-off from the GM 6-71 diesel that is now used only for the fire pump. For sizing purposes, it is anticipated that 165 HP will be continuously available from the power take-off to drive the main hydraulic pump. Since the main hydraulic pump will be operable only when the GM 6-71 diesel is running, it is envisioned that the electrically driven 30 HP/ 800psi hydraulic pump which is retained will also provide backup braking/reduced pulling capability for the new winches.

The following paragraphs give more detailed requirements for each of the major winch system components. It is expected that equipment suppliers will provide dimensioned drawings for equipment mounting and technical manuals covering service requirements. Suppliers must also provide overall system hydraulic and electrical schematics, along with power and hydraulic oil storage requirements.

Aft Winch/H-Bitt

Through experience with the winches currently installed aboard the YTB-836, it has been found that keeping the towing H-bitt as far forward as is possible on the aft deck is critical to the YTBs turning ability with a vessel in tow. For that reason, it is desired that the YTB-835 towing winch and H-bitt be mounted on a common base, having the shortest possible length. Line pull on the aft winch is considered to be more important than line speed, as the winch will enhance stern positioning capabilities of the single screw YTB during submarine and ship handling evolutions. Given this background, the following requirements exist for the YTB-835 aft winch:

- Drum capacity: 600' of 2" diameter braided Spectra line
- Line pull (minimum): 22,000 lbs. @ barrel working layer, led off top of drum
  16,000 lbs. @ mid-drum layer
- Braking capacity (min.): 170,000 lbs. @ barrel working layer
  125,000 lbs. @ mid-drum layer
- Maximum length for H-bitt/winch combination (overall): 7'-6"
- Maximum width for H-bitt/winch combination (overall): 4'-0" to port of centerline, 8'-6" overall
- Features: Hydraulic drive, with braking capability independent of main hydraulics
  Levelwind
  Variable speed control
  Sub-base sufficiently strong to carry all H-bitt and winch loads, with provision for bolting to a deck foundation (Note: H-bitt to be sized by winch braking capacity, with pull from any direction.)
  Sufficient space between winch and H-bitt to make line turns on H-bitt
  Primed and painted to resist corrosion (10-year coating)
  Designed to function in the marine environment, including elimination of water pockets

Forward Winch

Experience with the YTB-836 has shown that separate powering/control for each drum on a forward double drum winch is warranted, with separate line storage and working areas on each drum. Of particular concern is the potential for line burying on the drum during pulling. A shortcoming of the YTB-836 forward winch setup is that a windlass/wildcat no longer exists for anchor retrieval. Given this background, the following requirements exist for the YTB-835 forward winch:

- Configuration: Double drum, separately controllable, with line storage and working areas on each drum, and a wildcat for 1" diameter stud link anchor chain
- Drum capacity: 300' of 2" diameter braided Spectra line (each drum)
- Line pull (minimum): 22,000 lbs. @ barrel working layer, led off top of drum
  16,000 lbs. @ mid-drum layer
- Braking capacity (min.): 150,000 lbs. @ barrel working layer
  105,000 lbs. @ mid-drum layer
- Maximum fore-and-aft length: 5'-6"
- Maximum width (overall): 11'-0"

EQUIPMENT SPECIFICATION (CONT.):

Forward Winch (cont.)

- Features: Hydraulic drive (for each drum, with clutch for wildcat)
  Braking capability independent of main hydraulics
  Variable speed control (for each drum, including the wildcat)
  Provision for bolting to a deck foundation
  Primed and painted to resist corrosion (10-year coating)
  Designed to function in the marine environment, including elimination of water pockets

Main Hydraulic System (Including Pump, Clutch and Tank)

The main hydraulic pump needs to be of sufficient size to handle the maximum pulling power of one winch while simultaneously providing remote brake release/set capability to the other. It will be located in the machinery room , and driven by the GM 6-71 fire pump diesel power take-off (PTO), which will provide up to 165 HP at 1800-1900 RPM. A clutch mechanism is required for engaging/disengaging the pump. The overall length of the clutch plus pump shall not exceed 60", and the width shall not exceed 24". The combination shall be mounted on a sub-base suitable for bolting to a hull foundation directly forward of the fire pump. The new hydraulic system tank shall be 23"Hx 54"Lx 30"W, to fit immediately outboard of the new clutch and pump, and shall be capable of being supported from either the overhead or a deck/hull foundation.

Backup Braking/Pulling System

The backup hydraulic system must be capable of providing remote brake release/set capability and reduced pulling capability for both winches. In addition, the backup system must be capable of being switched over to operate the existing aft capstan. As stated previously, one of the existing 800psi hydraulic pumps, driven by a 30 HP, 450V, 60Hz electric motor (1765 RPM), will be retained and available for use with the winches.

Winch System Controls

Two winch control stations (one for the starboard side of the pilothouse and one for the port side), providing full capability for operating both the forward and aft winches (exclusive of the wildcat), are required for the YTB. In addition, local controls are required for the aft winch and forward wildcat. All control station boxes must be watertight, and be designed for corrosion resistance. The two main control stations should each consist of two 12"x 24"x 10" boxes, with one box to include complete aft winch controls and a switch for main vs. backup hydraulic system selection, and the second box to include all controls for the forward double drum winch. The controls shall be installed to permit ease of use and located so as not to interfere with the operation or maintenance of existing controls. Local controls for the aft winch, to be located at the 01 LVL steering station, shall duplicate the aft winch controls provided in the pilothouse. Local controls for the wildcat shall include a clutch mechanism, and otherwise shall provide the same degree of control that would be available to the winch. In general, the control system should be kept as simple as possible.

Closed Circuit Monitoring System for Aft Winch

Whereas the aft winch/H-bitt is not directly visible from the pilothouse, a camera on the aft winch/H-bitt and surrounding deck area is necessary for monitoring and safe operation of the aft winch from the pilothouse. Camera orientation shall be manually adjustable from the 01 LVL, and the installation shall be suitable for the marine environment it will operate in. The pilothouse monitor should be no more than 12"x12"x12" in size, and mounted from the overhead on a swiveling foundation to permit easy viewing while operating port or starboard winch system controls. The monitor shall be arranged so as not to interfere with other equipment and to provide minimal window blockage.

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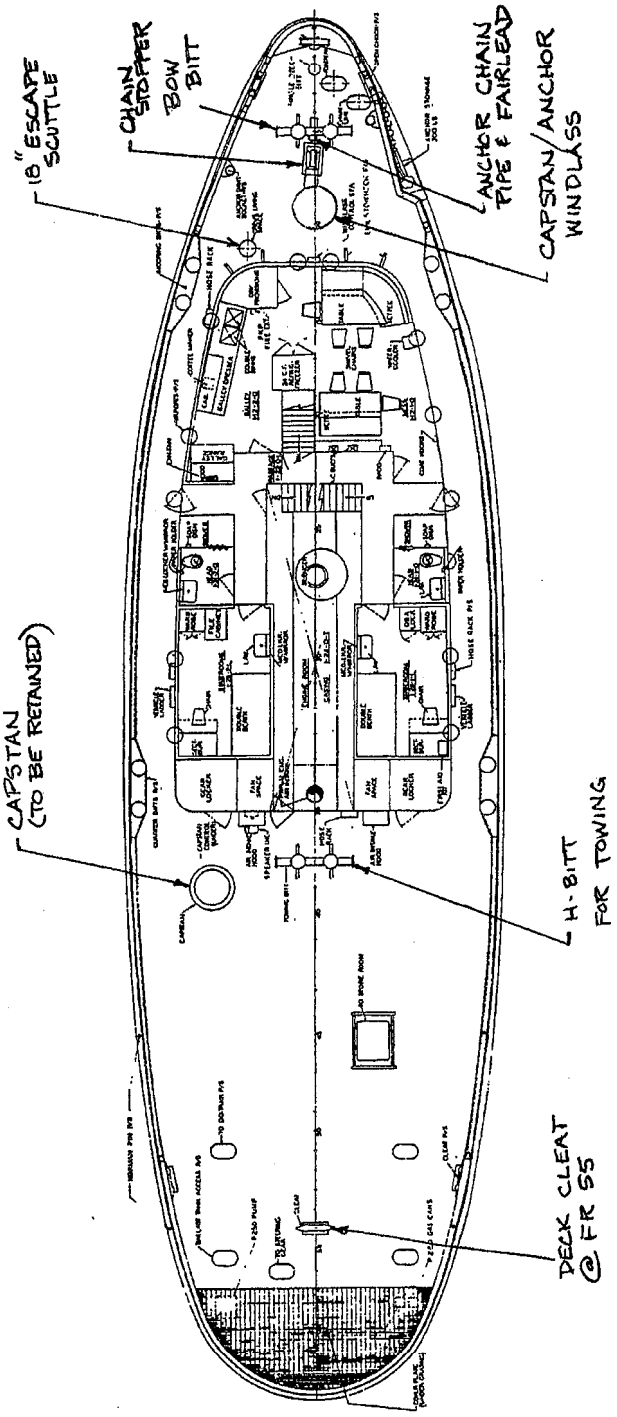
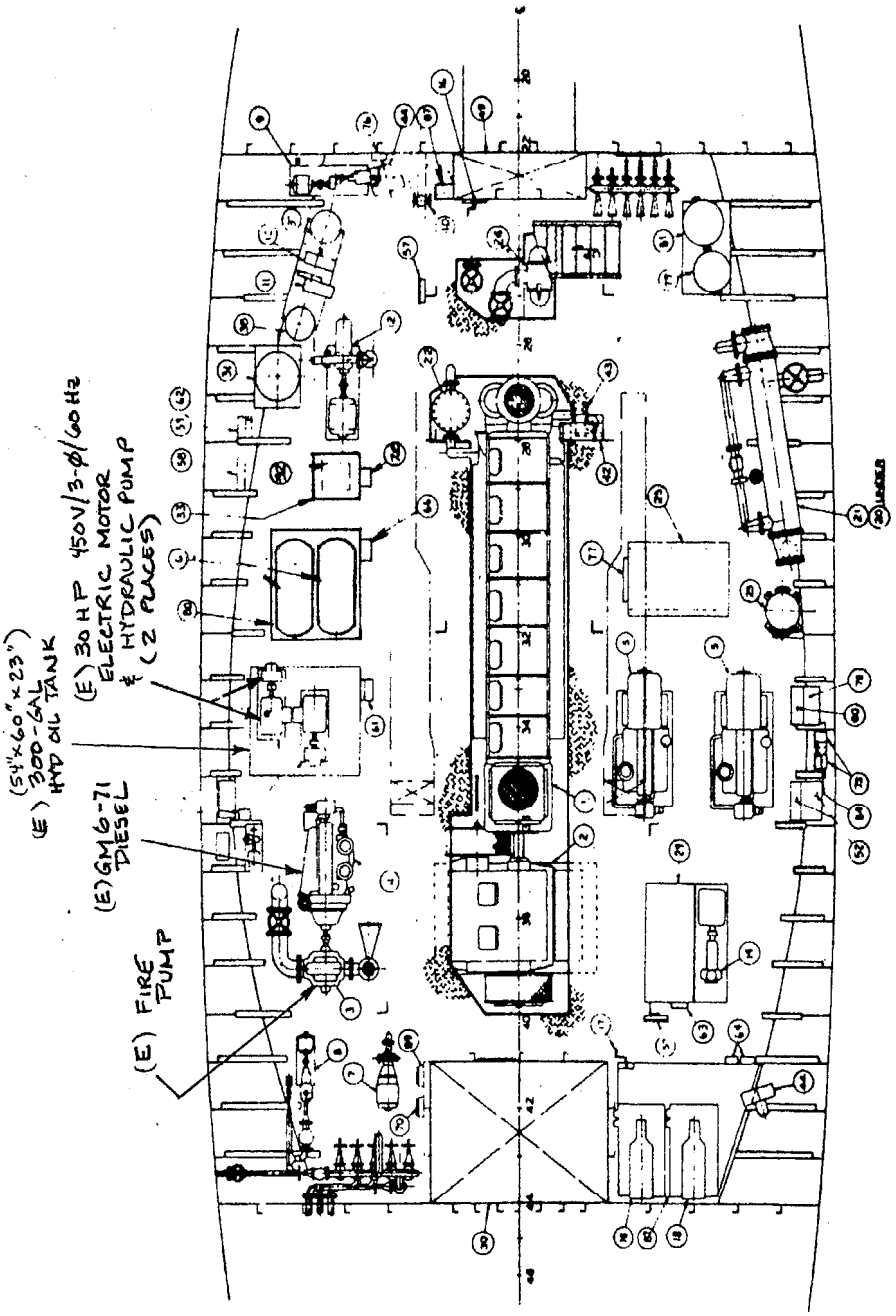


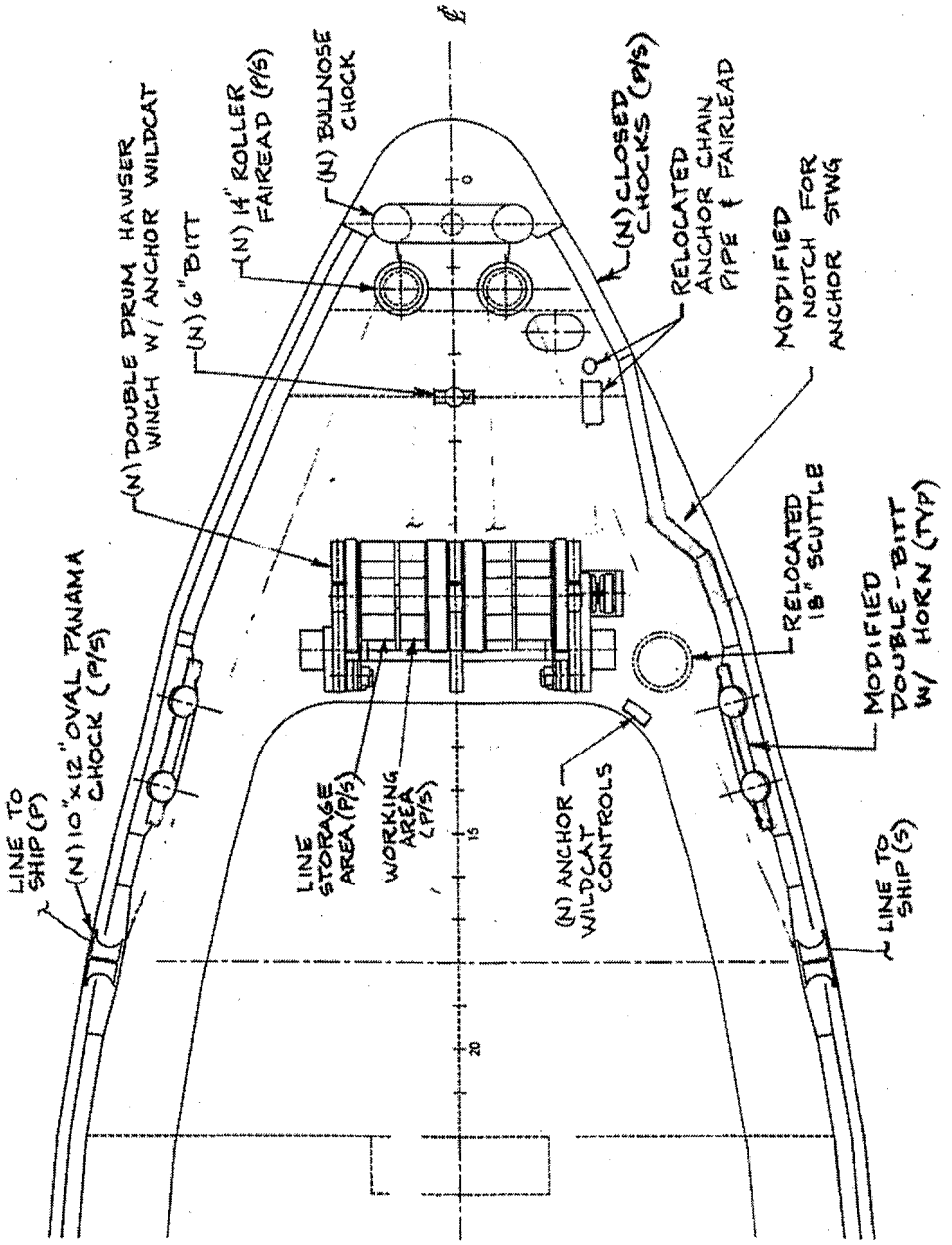
MAIN DECK PLAN

Figure 1. YTB-835 Arrangement Before Winch System Installation (sheet 1 of 2)



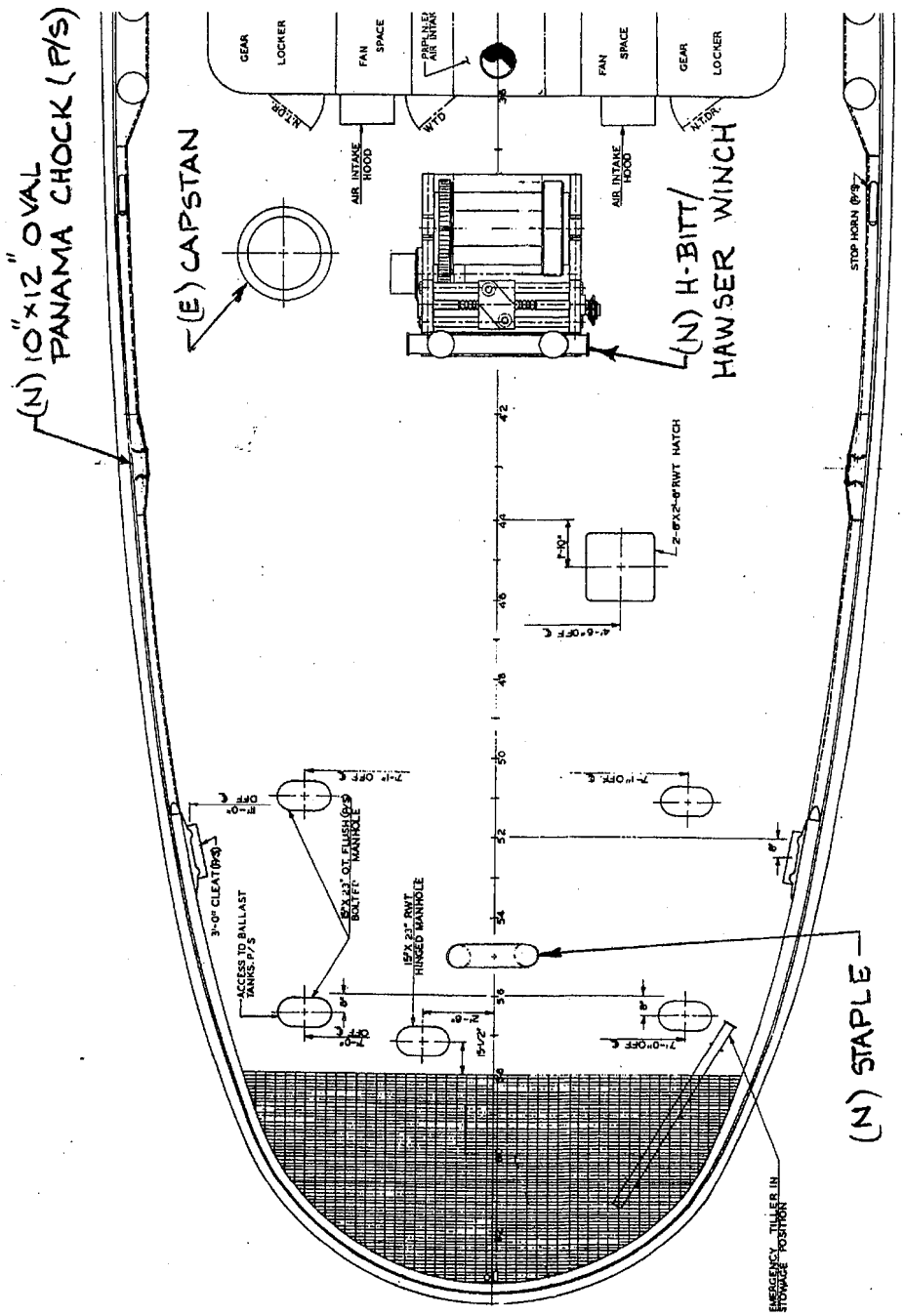
MACHINERY ROOM PLAN

Figure 1. YTB-835 Arrangement Before Winch System Installation (sheet 2 of 2)



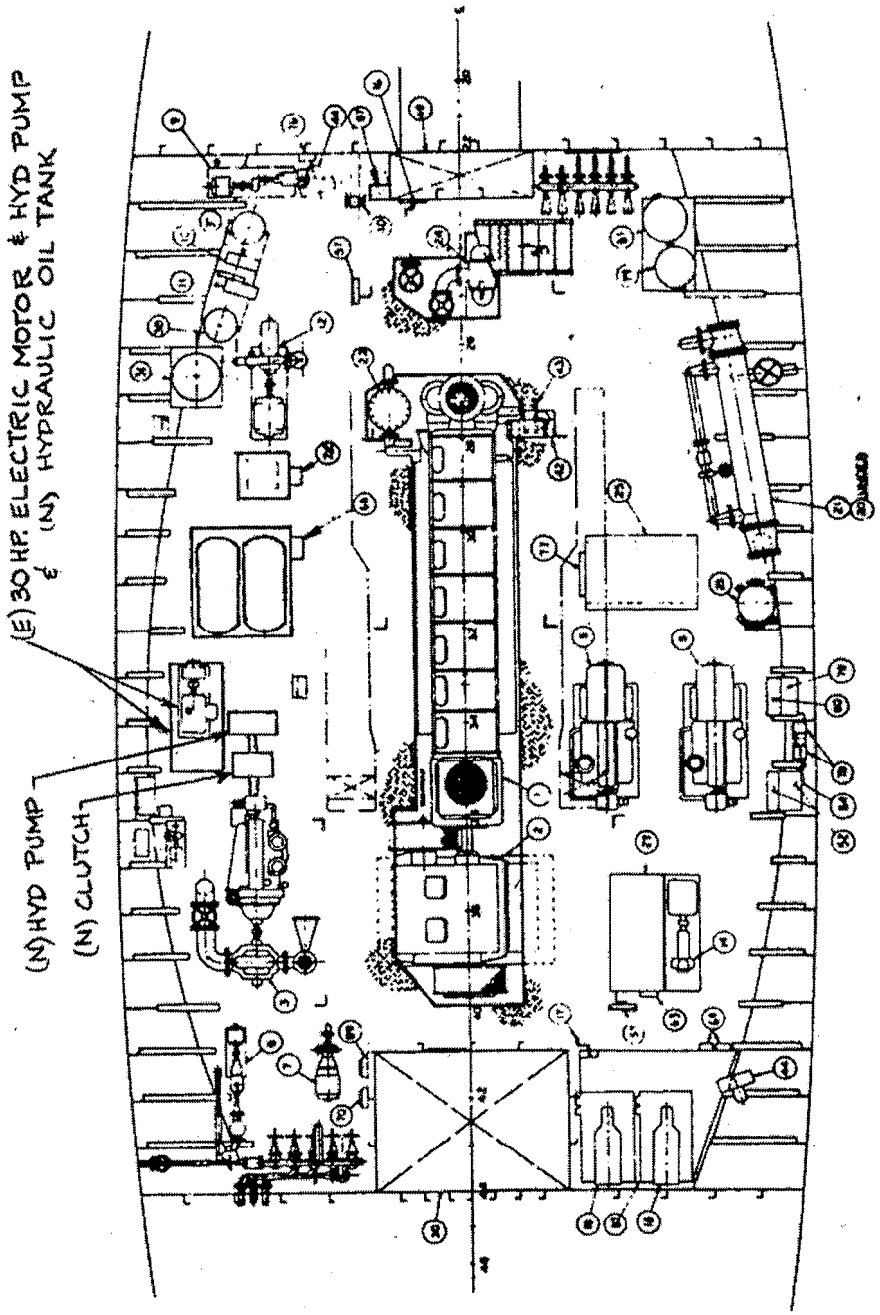
FORWARD MAIN DECK PLAN

Figure 2. YTB-835 Arrangement After Winch System Installation (sheet 1 of 4)



AFT MAIN DECK PLAN

Figure 2. YTB-835 Arrangement After Winch System Installation (sheet 2 of 4)



MACHINERY ROOM PLAN

Figure 2. YTB-835 Arrangement After Winch System Installation (sheet 3 of 4)

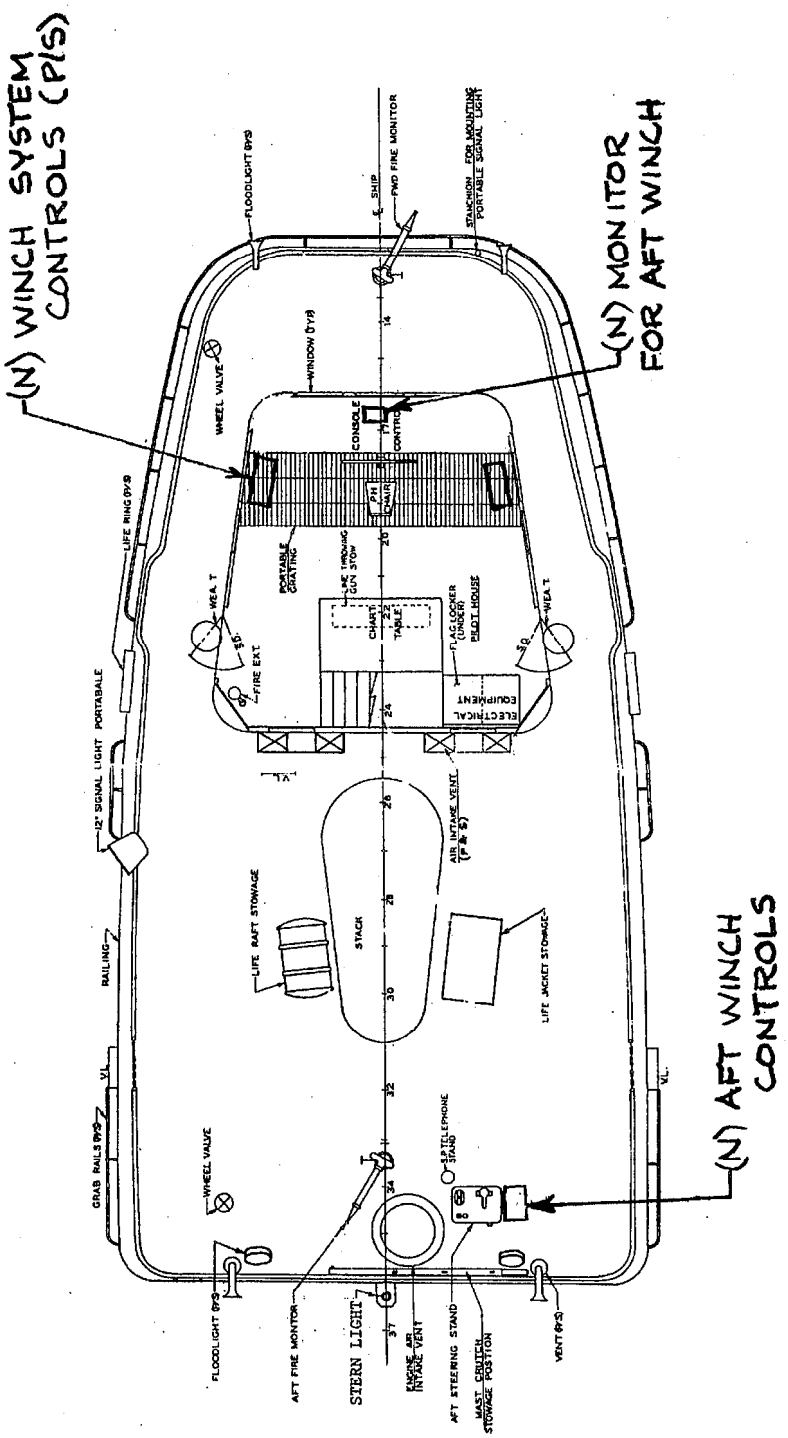


Figure 2. YTB-835 Arrangement After Winch System Installation (sheet 4 of 4)